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SOME MUSHROOMS AND OTHER FUNGI OF BRITISH COLUMBIA

By GEORGE A. HARDY

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HANDBOOK No. 4

SOME MUSHROOMS AND OTHER FUNGI OF BRITISH COLUMBIA

By GEORGE A. HARDY

HALF-TONE ILLUSTRATIONS BY FRANK L. BEEBE.

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Some Mushrooms and other Fungi of British Columbia.

INTRODUCTION.

The great variety of form and colour to be met with in the members of the Mushroom family often arouses more than a passing interest and kindles a desire to know something about their names, manner of life, and place in the economy of nature.

To those interested in the out-of-doors, mushrooms and their kind fill a definite niche in the calendar of the year; when the flowers of the field and forest are resting in obscure retirement, the mushrooms flaunt their charms unchallenged by would-be rivals in Flora's domain. The sombre woods and sodden fields are a fitting background for the display of their fragile beauty.

If reasons are desired for their study other than those of joy and pleasure in beholding them, then they are not wanting. Mushrooms have been and still remain a delectable article of diet from time immemorial; on the other hand, they are the source of one of the most deadly plant poisons known to man, while as an agent in converting vegetable debris into usable food substances for plants, they perform a service of incalculable value.

At one time, before the advent of scientific knowledge, superstitions and erroneous beliefs concerning them were rife, in some instances persisting to the present day. There is, therefore, every reason why every one should know at least the fundamental facts about mushrooms.

The gathering of the material for the present handbook was inspired by the interest shown in the series of models exhibited in the Provincial Museum. While mushrooms take the leading rôle in this booklet, some other conspicuous fungi that may occasionally be associated with them are included as a matter of general interest.

The word "mushroom" is of doubtful origin. One line of inquiry traces it to a combination of two Welsh words, "maes"

(a field) and " rhum " (a knob). Another, that it descended from the old French word " mousseron " (a moss, or something growing in mossy places).

Whatever the origin, there is no doubt that it was universally applied to the Meadow mushroom in England, always known to be wholesome and safe to eat; other kinds of similar appearance were called toadstools either because of their poisonous nature or because they were considered unfit for consumption. In the light of present-day knowledge such an arrangement is misleading, for there are poisonous mushrooms and edible toadstools. It is therefore becoming more and more the accepted practice to discontinue the use of the word " toadstool " and to use the word " mushroom " inclusively.

If undue stress appears to be laid on the edible qualities of the various species, it is because such information is constantly requested. In this connection too much emphasis can not be placed on the extreme importance of correct identification.

ACKNOWLEDGMENTS.

I am greatly indebted to Dr. J. Walton Groves, of the Central Experimental Farm, Ottawa, and to Dr. F. Dickson, of the Department of Biology and Botany, University of British Columbia, Vancouver, for their kind co-operation in reading the manuscript and for their most generous and valued constructive criticism.

Dr. Groves, especially, has gone to considerable trouble in naming and checking the identifications of most of the species, specimens of which are deposited both in Ottawa and the Provincial Museum.

LIFE-HISTORY AND STRUCTURE.

The life-cycle of a gilled mushroom may be divided into three phases.

1. THE SPORE.—The dispersal phase. The spore is a unicellular, microscopic structure varying in shape, sculpture, and colour according to the species. Dispersal may be by wind, water, or by animal agency. Of the hundreds and thousands of spores produced by one mushroom, only a small proportion of them are likely to meet with the conditions necessary for successful ger-

mination. Chief of these conditions are: The presence of a favourable *substratum* or material in which to develop, such as decaying wood or other vegetable matter; a favourable *temperature,* mild and constant over a period of time; and adequate *moisture.*

2. THE MYCELIUM.—The feeding phase. When a spore has settled on a suitable medium, it germinates by putting forth a protuberance which elongates to form a thread-like strand known as a *hypha.* By continual additions to the growing tip and much branching and intertwining, the hyphæ collectively form the *mycelium* or "spawn." The mycelium feeds by permeating the food substance and absorbing the products of decay. Many spores may combine to form any given mass of mycelium.

The mycelium is very retentive of life and may persist for many years, according to the nature and extent of its food. As a rule it radiates from the originating spore and is most active at its outer margin. In grassy places it tends to form circular patches, as is often visibly demonstrated at a later date by the appearance of mushrooms in the form of rings, the "fairy rings" of mythology. In trees the mycelium often collects in cracks of the wood in sheet-like masses. In other species of mushrooms the mycelium is able to bridge gaps in the food-supply by forming string-like growths over the unsuitable places.

3. THE MUSHROOM.—The reproduction phase. At certain periods of its life the mycelium tends to form little knots or knobs of closely packed hyphæ; these enlarge and eventually push up or out to the air and light. This is the *"button"* stage of a mushroom.

If a button is sliced vertically in two, a miniature and much-compressed edition of the future mushroom will be seen tightly wrapped in the outer membrane. At a favourable moment the cells of the incipient mushroom expand rapidly by an inrush of fluid. The extraordinary power possessed by the mushroom at this stage of growth enables it to force its way through obstacles in its path

upward; occasionally pavements are upheaved and hard road surfaces are penetrated in a sensational manner.

During this period of rapid growth the inelastic outer coat splits irregularly around the middle, the upper part adhering to the fast enlarging cap, where it may remain in the form of scales, warts, or fringes, while the lower section adheres to the base of the stem either completely or partially. In the latter case it gives rise to the *death cup* or *volva,* the presence of which forms an important diagnostic character in some of the poisonous mushrooms.

In many mushrooms the delicate gills on the underside of the cap are further protected by a thin membrane or *veil,* stretching from the edge of the cap to the stem. As the cap continues to expand, the membrane breaks away from its edge but still adheres to the stem to form the *ring.*

The gills consist of a series of vertical plates radially disposed on the underside of the cap. These plates are covered by the spore-producing tissue, the *hymenium,* from which arise elongated cells, the *basidia,* bearing the spores externally at the tip, very often four to the cell. The spores are usually forcibly thrown from the sterigmata or "stalks" by an explosive mechanism; this force is sufficient to throw them clear of the hymenial surface, after which they fall vertically by gravity. Mushrooms are geotropic, so that the gills always hang vertically downward.

With the plan of the gilled fungi in mind some of the many variations of spore production may now more easily be understood.

The Pore Fungi.—Instead of bearing spores on gills, the pore fungi produce spores in little closely packed vertical tubes, the lower open end constituting the "pore." The hymenium lines the inside surface of each tube, from which the basidia arise in the same manner as in the gilled mushrooms.

The pore fungi are of two types: the clod fungi, or boleti, often have fleshy, bun-like caps and central stems,

and the bracket, or shelf, fungi which are hard and woody and are attached to trees by one side of the cap. They are usually stemless, though some related kinds have a central stem.

The Tooth Fungi.—In this group of fungi, which includes the genus *Hydnum*, gills and pores are replaced by numerous small downward-pointing spines, over the surface of which the hymenial layer is spread. To this family belongs the well-known but uncommon Bear's Head fungus. Other species are leathery in texture with central stems or form shelving growths on trees and logs.

The Coral Fungi.—In these the spores are produced by the hymenial layer which covers the tips of the branches so characteristic of this easily recognized group of fungi.

The Puffballs.—The common puffballs are familiar to every one. The spores are produced on basidia in a similar way to the preceding, but the basidia are contained within the central tissue of the ball. When mature they are ejected by the rupture of the outer coat, either through an apical hole, by a radial splitting of the exterior membrane such as obtains in the earth-stars, or by an irregular tearing of the outer skin. In all cases the spores are emitted in a dense cloud.

The Bird-nest Fungi.—In the Bird-nest fungi the spore-bearing basidia are developed within the tiny "eggs" that lie in the base of the ripe "nest" at maturity, escaping only when the "shell" decays.

The Witch's Butter.—In this section of the fungi the hymenium covers the entire surface of the slimy convoluted mass. From this arise the spore-bearing basidia which eventually produce spores of a new generation.

Morels, Saddle, and Cup Fungi.—In the foregoing fungi we have seen that the spores are produced externally at the tip of the basidia. In this group the basidia are replaced by *asci*. An *ascus* is somewhat similar in form to a basidium, but the spores, usually eight in num-

ber, are contained within the cell and are liberated through the top of the ascus either by means of a lid or a slit.

The hymenium bearing the asci lines the sponge-like pits in the head or cap of the morel, the folds of the saddle fungi's cap, and the inside surface of the cup fungi.

These are but a few of the many methods of spore production to be found in the fungi.

IDENTIFICATION.

The illustrations, together with the appended notes and descriptions, are intended to be a general guide to the identification of a few of the species most likely to be met with on Vancouver Island and the adjacent Mainland. With one or two exceptions all material was locally gathered in the vicinity of Victoria and Duncan, Vancouver Island.

The assignment of any given mushroom to the correct species is often a difficult matter, due to the close similarity that so many of them bear to each other. Some of the characters essential for identification are very evanescent and are soon lost in drying or through decay; others are microscopic, while only experience can evaluate the relative importance of such variable qualities as texture of cap and stem, shape and nature of the gills as to attachment to the stem, form of veil, ring, and so forth.

A good method for the beginner is to take a well-known species such as the common mushroom or Shaggy Mane and carefully check each point with the technical account; in this way the application of the terms employed will be more easily understood.

No estimate as to the number of different kinds of mushrooms occurring in British Clumbia can be hazarded, but an inference might be made from the known facts in other parts of North America, making due allowance for climate and geographical position. A list of close on 400 species was published in 1926 as growing within a 12-mile radius of Ottawa; no doubt the list has been greatly increased since then. In 1944 a list of the fleshy mushrooms of the Great Lakes district amounted to 1,200 species. Considering the favourable position of British Columbia with its vast forest and moist equable temperature prevailing over extensive areas, it is not unlikely that the mushroom flora will eventually prove to be at least equal to, if not to exceed, any other comparable terrain on the continent.

In view of the foregoing remarks it is perhaps hardly necessary to add that most of the genera dealt with in this handbook often contain a large number of species, and that for the most part only one or two representatives of the more common genera have been selected for inclusion here.

FIELD KEY.

(Chiefly referring to those illustrated in this handbook.)

1 (13) *Fungi soft, soon perishing.*

2 (9) Caps present (in one form or other).

3 (4) Caps with gills. — Agaricaceæ. (Mushrooms.)

4 (5) Caps with pores. — Boletaceæ. (Clod fungi.)

5 (6) Caps with honeycomb-like pits. — Morchella. (Morels.)

6 (7) Caps wrinkled. — Gyromitra. (Bonnet fungus.)

7 (8) Caps saddle-shaped. — Helvella. (Saddle fungi.)

8 Caps with soft spines below. — Tremellodon. (Jelly fungi.)

9 (2) Caps absent.

10 (11) Fruiting body cup-like. — Pezizaceæ. (Elf-cup fungi.)

11 (12)	Fruiting body jelly-like, convoluted.	Tremella. (Witch's Butter.)	
12 (11)	Fruiting body stalked; simple, branched or cauliflower-like.	Clavariaceæ. (Club fungi.)	
13 (1)	*Fungi woody or leathery.*		
14 (15)	Caps present; pores present.	Polyporaceæ. (Shelf fungi.)	
15 (14)	Caps absent.		
16 (17)	Fruiting body round, pear- or star-shaped.	Lycoperdaceæ. (Puffballs, earth-stars.)	
17 (16)	Fruiting body cup-like.	Nidulariaceæ. (Bird-nest.)	

SPECIES ACCOUNT.

The dominant motive in the preparation of the species accounts has been the living mushroom or fungus as it is found growing in its native haunt. Under these conditions mushrooms and their kin have the greatest æsthetic appeal; the grace of form, delicacy of colour, and the varied habitats are then most likely to attract attention.

Technical descriptions have been reduced to the minimum required for the enumeration of the salient features of the more easily recognized species.

Brief notes have been included on the uses, habits, or other matters that might kindle a greater desire to know these lowly plants and so add to the enjoyment of a country ramble.

In a work of this kind a phylogenetic consideration of the species is out of place; nevertheless, it is thought that an acknowledged form of classification would be helpful to those who may be inclined to follow up the subject in more detail. To this end the sequence of

families is taken from "Outline of the Fungi," by G. W. Martin, a convenient condensation which shows the position of any family in relation to the others at a glance. The genera and species, however, are listed in alphabetical order, using for this purpose the scientific names.

ELF'S SADDLE.
(Edible.)

Helvella lacunosa Afz.
Helvella (or *Elvella*) = a small pot-herb; something fit to eat.
lacunosa = with many cavities.

Description.—Cap 1 to 2 inches or more, variable in shape, inflated, lobed, lobes deflected, adnate, ashy-black.

Stem 3 to 5 inches, irregular, thick, hollow, extensively grooved and pitted, whitish-grey.

Remarks.—The odd-looking caps and saddles of the Elf's Saddle arrest the attention when found growing on some woodland trail, often in the middle of the path. They usually occur singly or in scattered groups in moist woods. The smoke-like puff of the ripe spores as they are shot out of the microscopic asci that line the upper surface of the cap is a characteristic feature. Properly prepared, they are highly esteemed as a food, imparting a delightful flavour to ordinary fare.

BROWN BONNET. *Gyromitra brunnea* Underwood.
Gyromitra = to turn, and a hat or bonnet.
brunnea = brown.

Description.—Cap 2 to 4 inches across, highly contorted, much wrinkled and folded, adhering to stem in many places, chocolate-brown in colour.

Stem 3 to 5 inches including cap, stout, fleshy, spongy, solid at base, hollow above.

Spores hyaline, oval.

Remarks.—The large, crinkled head of this odd-shaped fungus resembles the battered bonnet of some ancient woodland sprite. A slight jar of the mature form will cause a smoke-like cloud of spores to be discharged from the asci lining its irregularities.

This species occasionally attains a large size and would seem to offer a substantial morsel to the mushroom gatherer. However, it might be advisable for the novice to leave this species alone since it closely resembles another species, *G. esculenta,* which, in spite of its name, is regarded with suspicion.

Specimens have been found growing on decaying logs of black poplar.

COMMON MOREL.

Morchella esculenta Pers.
Morchella = a mushroom.
esculenta = esculent, edible.

Description.—Cap up to 2½ inches, ovate to oblong, adnate to stem at base, sponge-like, pitted, the spores borne in asci lining the pits, dingy-yellow to tawny.

Stem stout, even, hollow or stuffed, whitish.

Spores elliptical, hyaline.

Remarks.—Aptly enough this morel is also called the Sponge mushroom. It is probably one of our best-known mushrooms, with the possible exception of the commercial species.

Care should be taken not to confuse it with the Brown Bonnet, from which it may be readily distinguished by the pronounced pits which are lacking in the latter.

There are several kinds of morels, but they are all edible and, consequently, are favourites with mushroom consumers whenever they can be found. Morels are very partial to burnt-over areas, where they may often be picked up by the bushel, a fact so well known that in the past forests have needed protection from overenthusiastic morel-lovers who have deliberately set fire to patches of woodland for the sake of the morels that later spring up in abundance. *M. conica* is more partial to this habitat than *M. esculenta* which usually grows in grassy places.

The morel is found most commonly in the spring months of the year, under coniferous trees and in woodland borders, glades and dells.

In a time of plenty they may be dried and so preserved indefinitely, needing only to be soaked in water before using in the same manner as freshly picked specimens.

JELLY FUNGI. FAMILY TREMELLACEÆ.

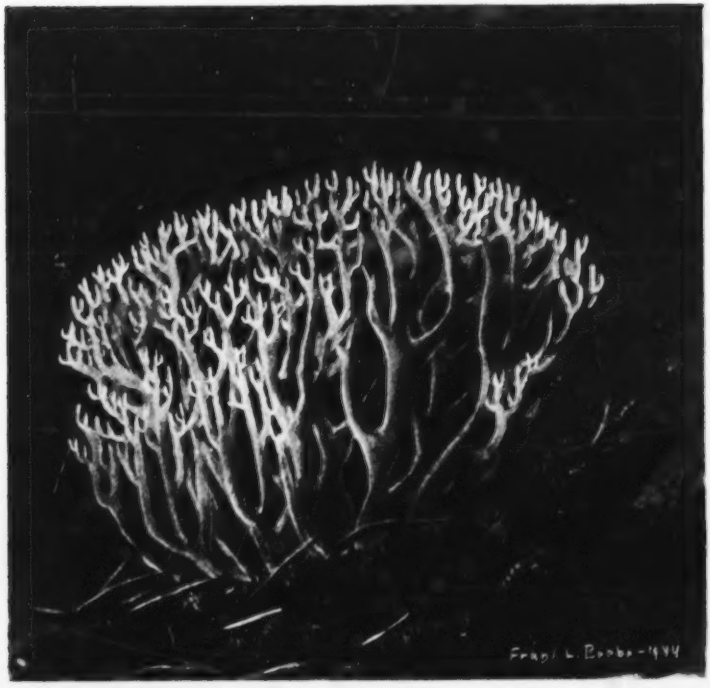
WITCH'S BUTTER.
(Edible.)

Tremella mesenterica (Retz.) Fr.
Tremella = trembling.
mesenterica = mesentery; an anatomical term in reference to tissue supporting the viscera; folded.

Description.—Up to 3 inches in diameter; soft, moist, and gelatinous, convolute, bright orange in colour. Spore-bearing tissue covers the entire surface. Spores white.

Remarks.—In the days of long ago those of an imaginative turn of mind compared the bright yellow masses adhering to fallen branches or rain-soaked stumps to dabs of butter as passing refreshment for the elves and pixies during the intervals of their midnight revels.

As a matter of fact they are as good eating in reality as they were supposed to be in fancy.



DRYAD'S BROOM.
FIR-WOOD CLAVARIA.
(Edible.)

Clavaria abietina Pers.
Clavaria = a club.
abietina = of fir-wood.

Description.—Much-branched, dense, bushy tufts 2 to 4 inches high; base thick, short with white down; dark ochraceous, turning greenish when damaged.

Hymenium covering all sides of the branchlets; there is no structure corresponding to the gills of mushrooms.

Spores oval, ochraceous.

Remarks.—The compact brush-like tufts of this clavaria are often to be found in woodland places wherever there is a carpet of fir-wood debris covering the ground. While not usually conspicuous they add a note of variety to the general picture of forest life. Occasionally they may grow on an old well-rotted stump and once in a while in the garden-patch where compost from the woods has been used.

All clavaria are safe to eat but are not necessarily palatable. This species is not known to be especially tasteful.

ROSETTE.
CAULIFLOWER FUNGUS.
(Edible.)

Sparassis crispa Fr.
Sparassis = to tear in pieces.
crispa = curly.

Description.—Above-ground portion 10 to 12 inches in diameter, like a large rosette formed by the compact intertwining of an inch-wide ribbon; pale tan to yellowish-white in colour.

Connected to mycelium below ground or within decayed wood by thick root-like base.

Spore-bearing tissue covering the entire surface of the ribbon-like convolutions.

Remarks.—This fungus is readily recognized by its large size and distinctive appearance. By no means common, it is likely to be found unexpectedly anywhere in open woodland country.

According to those who have eaten this species, it is one of the most highly prized of the edible fungi.

GLOBE POLYPORE.

Cryptoporus volvatus (Peck) Shear.
Cryptoporus = hidden pores.
volvatus = globe-shaped.

Description.—Sporophores 1 to 2 or more inches across, egg- or shell-shaped, convex above and below, hollow with a small hole on under-side near base. Colour, golden-brown above, whitish below.

Pores concealed by lower surface which acts as a shield protecting the pore surface which depends from the upper interior; yellowish-

white. Spores accumulate within, dispersing through the hole which appears on the under-side at maturity.

Spores flesh-coloured.

Remarks.—This species is one of the most unique of the polypores. Superficially the fruiting bodies resemble puffballs growing on the side of a tree. Those illustrated were taken from a standing, long-dead Douglas fir of considerable age. The trunk was dotted all over with the little balls from base to top and on all sides, with the greater number on the northern aspect.

The spores are piled on the "floor" of the lower casing and trickle out of the small opening, either from the action of insects crawling within, by chance jars, or by gravity, for the "floor" slopes toward the hole; in this way dispersion may continue over a prolonged period of time. As the exit hole does not appear until the spores are ready to be discharged, the pore surface is protected from the ravages of insects and other marauders.

PINE DESTROYER. *Fomes pinicola* (Swartz) Cooke.
Fomes = tinder.
pinicola = pine dweller.

Description.—Four to 14 inches by 2 to 8 inches (one 9½ by 18 inches is recorded). Perennial, increasing by annual additions to the pore surface. Variable in size and shape, roughly hoof-shaped on standing trees and more bracket-like on fallen timber. Upper surface

smooth to coarse in texture, blackish-brown on the older part; the new growth at edge white, becoming reddish and with a varnished appearance as it grows older.

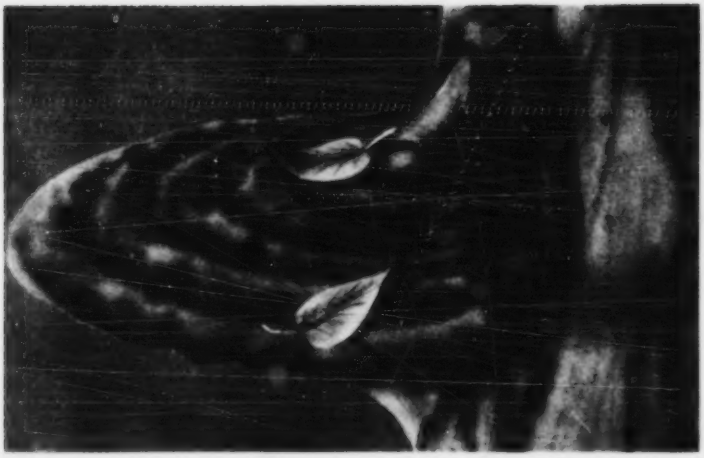
Pore Surface.—Pores minute with a band of sterile pore surface at margin, white to pinkish-cinnamon. Spores hyaline.

Remarks.—This is one of the most abundant and destructive of the bracket fungi. It is usually found on dead pines, spruce, balsam, poplars, alder, and other trees, particularly on stumps and fallen timber, but standing trees killed by insects and other means are as readily infected. The fungus gains entrance by some beetle-hole or other break in the bark. Ninety-one species of trees, both coniferous and deciduous, have been recorded as hosts.

The infestation is known as "brown cubical rot," from the final effect of its ravage to the tree attacked; the "punk" wood breaks up into a series of brittle cubes with white mycelial felt in the cracks, falling apart at the least touch.

In allied species and possibly in this one also the inner substance of the bracket was utilized as a tinder for catching the sparks made by striking flint on steel, and also as a razor-hone. In an emergency it makes a substitute for bottle-corks. These uses might be worth knowing to the camper and others whose business or pleasure takes them into places far from civilization.

The Pine Destroyer is widely distributed in Europe and North America and is also reported from Cuba, the Philippines, and Siberia.



DRYAD'S SADDLE. *Ganoderma applanatum* (Pers.) Pat.
Ganoderma = shining skin.
applanatum = flat.

Description.—Two to 8 inches by 12 to 24 inches and 5 to 12 inches thick. Shelf flat, horizontal, hard, and woody; perennial, growing larger each year by concentric rings on the outer edge of the preceding year's growth. Upper surface smooth, irregularly marked with small elevations and rugosities, brown to smoky. Under-surface bearing small pores, creamy-white.

Spores, rust colour.

Remarks.—The smooth inequalities of this distinctive bracket fungus have the appearance of being made of molten metal suddenly cooled in the act of flowing; the flat, horizontal upper surface is a sure indication of its identity, while the large symmetrical dimensions often attained give it a distinctive appearance.

Deciduous trees seem to be the favourite host among which may be specifically mentioned the black cottonwood, from which the specimen illustrated was obtained. Its spores gain entrance to the wood of both dead and living trees through wounds caused by wind-broken branches, insect-holes, and the like.

Fine specimens make excellent foundations for artistic work, for the light-coloured under-side is easily stained a permanent brown by the least scratch. It is thus a ready-made medium for outline sketches and etchings whose attractiveness is only limited by the ability of the artist. Turned upside down, with a piece of the bark attached, they make excellent shelves for ornaments, or, with a hole drilled into the surface, they make convenient candlesticks.

VARNISHED BRACKET FUNGUS. *Ganoderma oregonensis* Murr.
oregonensis = of Oregon.

Description.—Cap up to 8 inches, heart- or kidney-shaped. Typically forming a bracket; smooth, shiny, as if varnished; very light in weight; chestnut-brown; inside a white or creamy maze of entwined hyphæ.

Pores small, greyish-white.

Stem, when present, lateral and of irregular knobby growth as long as or much longer than the width of the bracket.

Remarks.—The stump of a very old Douglas fir is a likely place to find this distinctive bracket or "conk." It may form a shelf on the side of the stump or grow up from a root near the base, in a vertical manner; the fruiting surface gradually turns over until it faces down, much resembling a pipe with the stem stuck into the ground.

If the sporophore originates in a dark crevice, it will elongate considerably until the spore-bearing part has reached the light and is free of adjacent obstacles. Hardly any two stems are alike, each suiting the particular circumstances of position in respect to light and other factors.

The decay caused by this fungus is known to the lumberman as "white pocket rot," affecting Sitka spruce, Douglas fir, and western hemlock from Alaska to California.

VELVET-TOP FUNGUS.

Polyporus Schweinitzii Fr.
Polyporus = many pores.
Schweinitzii = named after Rev. David Lewis de Schweinitz.

Description.—Cap up to 12 inches, umbrella-shaped, irregular wavy margins, often in broken series, soft, velvety, drying hard and brittle; red-brown with pale ochre margin. In young stage, surface yellow, changing to brown when bruised.

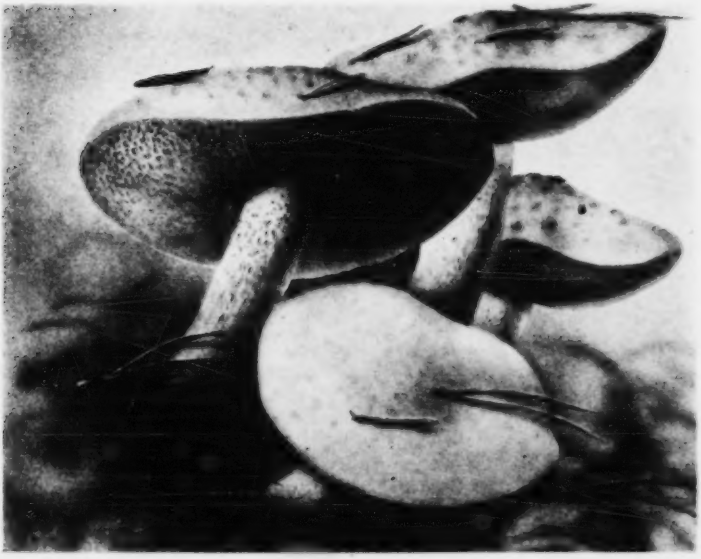
Pores small, yellowish-green to dark olive-green where damaged, finally becoming black.

Stem central, short, thick, irregular.

Remarks.—Its sombre coloration renders this fungus somewhat inconspicuous, but what it lacks in showiness it makes up for in size, a character that is likely to attract the attention of the most casual observer.

Further acquaintance with its manner of life is accompanied with mixed feelings of regard, for its mycelium is a deadly foe of coniferous trees within its grasp. The lumberman knows it as "brown cubical rot." Its ravages in the wood are seen as yellow streaks and patches, finally causing the wood to split into cubical, soft cheesy masses. The roots and butts of trees are its special quarry, the infestation often weakening the tree to such an extent that it is readily blown over by a strong wind.

The Velvet Top as we see it is the fruiting stage. It may appear at the base of the affected tree or some distance away, above one of its roots. It is an annual and is quite attractive to a variety of animals as an article of food.



PALE-GOLDEN BOLETUS.
(Edible.)

Boletus subaureus Pk.
Boletus = a clod; a lump.
subaureus = nearly golden.

Description.—Cap 2 to 4 inches. Smooth, viscid when wet, convex to plane, yellow with cinnamon flecks. Flesh yellow.

Pores small, angular, pale yellow.

Stem 2 to 3 inches, stout, bulbous at base, yellow throughout, dotted with reddish flecks and streaks.

Spores dark brown.

Remarks.—The thick ample caps of the boleti are often a feature of open woods and glades or of the borders of rural paths and roads, suggesting choice buns and cakes to those with an eye for possible titbits in the fungus line.

While all boleti are not edible, this species is considered one of the best of the food fungi. Squirrels are very fond of storing species of

boleti for food, taking them up into the crotches of trees where they soon dry and will keep indefinitely for a future need.

The genus *Boletus* comprises a large number of species, many of which are difficult to distinguish because of their similar appearance.

PAINTED BOLETINUS.
(Edible.)

Boletinus pictus Pk.
Boletinus = a little boletus.
pictus = painted.

Description.—Cap 2 to 4 inches, convex to plane, rough with minute fibrous scales. Colour reddish, finally showing yellowish

beneath scales, giving general effect of a reddish to a yellowish brown. Flesh yellowish, soon darkening to pinkish-brown.

Pores large, bright yellow, turning brownish where bruised.

Stem 2 to 3 inches, stout, fibrillose, same texture and colour as cap, yellow above veil.

Veil densely cottony in young, disappearing with age.

Remarks.—The Painted Boletinus is a very handsome species; the rich colours will give a thrill of delight to the finder, a sufficient reward for much arduous search among the debris of forest-growth where it flourishes.

Neither do the pleasing colours belie its true character, for it ranks among the very best of the edible fungi.

MEADOW MUSHROOM.
(Edible.)

Agaricus campestris (L.) Fr.
Agaricus = an agaric; old name for mushroom.
campestris = a field or meadow.

Description.—Cap 2 to 4 or more inches, hemispherical, convex to nearly plane, smooth silky-downy, sometimes scaly, creamy-white to light brown.

Gills free, close, pale pink to dark brown according to age.

Stem 2 to 4 inches, short, thick, smooth, white.

Ring near the middle, edges torn; occasionally evanescent.

No volva.

Spores elliptical, purple-brown.

Remarks.—The Meadow Mushroom is found only in open fields and never in woods where the deadly kinds usually grow. The pink gills, presence of a ring, absence of volva or cup at the base of the stem, and occurrence in open meadows are the chief characteristics for easy recognition.

It is cultivated extensively on a commercial basis and constitutes an important industry in many parts of the world, especially in thickly populated centres where a ready market for a perishable product is obtained.

Wherever it occurs, it is renowned as an article of diet, mention of it cropping up in chronicles of the past, in extravagant eulogies, and accounts of elaborate preparation for the tables of the wealthy of the times.

FLY AGARIC.
(Deadly Poisonous.)

Amanita muscaria Fries.
Amanita = from Mt. Amanus, on border of Syria, where the first specimens were supposed to have been obtained.
muscaria = a fly.

Description.—Cap 3 to 5 inches, globose to convex and plane, typically covered with wart-like scales, but these may be washed off by heavy rains; normally red but commonly a yellowish colour.

Gills free but reaching the stem, crowded, uneven, white or tinged with yellow.

Stem 4 to 6 inches, thick, scaly, with bulbous base margined with concentric rings, whitish.

Ring soft, lax, wide.

Volva present but not always obvious, usually clinging to the top of bulbous base in a series of ascending rings on the stem.

Spores white.

Remarks.—This is perhaps one of the most famous or infamous of all the mushrooms. Its poisonous properties are associated with the early history of the Greeks and Romans, who considered it "very conveniently adapted for poisoning." In Siberia, on the other hand, it is or was used as an intoxicant in much the same way that opium and alcohol are used elsewhere. A very small quantity of this mushroom may be fatal. It is bitter to the taste, which might be a preliminary warning to go no further. Its effect may be felt in from one to six hours after ingestion. The poison may remain in dried specimens for at least ten years. The chief poison involved is the alkaloid, muscarin, which affects the nerves of the heart. Quick removal of the offending substance and an injection by a physician of the drug atrophine is an effective treatment.

The cap has been used to kill flies, first being sprinkled with sugar in order to attract them. A fluid extract of this mushroom sprinkled on beds and furniture has also been used with success in exterminating certain unpleasant household insects.

In Belgium the beauty of the vivid red cap, which is the predominating colour there, is so much admired as to be used as a motif in ornamental designs for jewellery and in picture post-card designs.

The Fly Agaric grows in woods or on trailsides in small groups of two to several individuals and is of quite frequent occurrence.

Specimens are often seen in which the ring appears to be absent and the volva poorly developed, hence the necessity of knowing the species thoroughly well in order to avoid accidents.

DESTROYING ANGEL. (Deadly Poisonous.)

Amanita phalloides Fr.
phalloides = like a cone.

Description.—Cap 3 to 5 inches, oval to plane, occasionally umbonate with a raised margin in age, smooth, even, viscid when young, sometimes with scaly fragments of volva adhering; white, yellowish-brown to blackish-brown, centre of cap darker.

Gills free, ventricose, white.

Stem 4 to 8 inches, smooth, bulbous and solid below, tapering and hollow above, white.

Ring superior, reflexed, usually entire, white.

Volva margin torn, free, partly buried in the soil.

Spores white.

Remarks.—This is the most deadly of all the mushrooms, and the one perhaps that has caused all mushrooms to be viewed with suspicion where their edibility is concerned; and rightly so, for in certain stages of its growth it superficially resembles harmless species. However, a little study will soon enable any one to distinguish between the poisonous and non-poisonous kinds.

As a rule this is a woodland species, hence the uninitiated would do well to avoid mushrooms growing in such places until a certain knowledge of them is acquired. In any case it is wise to be careful of the "button stage" in all mushrooms until further development makes known their identity beyond question.

The character outlined, together with the illustration, cover the salient features of the Destroying Angel. However, in practice some of them are not always discernible; the ring may be torn off or the volva damaged, but the gills are always white. Therefore, give white-gilled species a close scrutiny. Sometimes this species is found growing on lawns, away from trees, but this would only happen where tree-roots or other woodland debris is buried beneath.

The poison involved is a tox-albumin, phallin, an extremely virulent toxin, found not only in plants but in rattlesnakes and other venomous animals. It affects the digestive organs and kidneys, causing cramps, convulsions, and a most painful death. There is no known antidote, although recently the Pasteur Institute is said to have evolved a counter measure.

Unlike that of *Amanita muscaria,* the taste is not unpleasant, while the symptoms of poisoning are not apparent until nine to fourteen hours afterwards, by which time most, if not all, of the poison will have been absorbed. Death occurs within two to four days.

GRISETTE.

Amanitopsis vaginata Fries.
Amanitopsis = resembling the Amanita.
vaginata = a sheath.

Description.—Cap averaging 2½ inches across, ovate to convex and expanded according to age; smooth, fragile; whitish to brownish and mouse colour, mostly dusky brown.

Gills free, fairly close, white to pale grey.

Stem 4 to 5 inches, smooth, even, pale brownish.

Volva at base of stem elongate, thin with ragged margins, permanent and easily seen. No ring.

Remarks.—This woodland dweller occurs solitarily or in groups of widely spaced individuals growing on the ground among decaying debris. Its long stem gives it a somewhat stately appearance.

Care must be observed should table delicacies be a consideration, for it closely resembles the poisonous Amanitas, though the absence of a ring or veil separates it from the deadly species. The presence of a volva should at once arouse suspicions as to the possibility of it being one of the deadly mushrooms, for this is an important diagnostic character of the Death Angel. The fact that there is no ring is not necessarily proof that it is not a deadly species, for the ring may be absent from the latter due to some cause or other. Under these circumstances no novice should add this species to the food-basket.

FALSE CHANTARELLE. *Cantharellus aurantiacus* Fr.

Cantharellus = a small cup or vase.
aurantiacus = orange-coloured.

Description.—Cap 2 to 3 inches, smooth or downy, depressed in centre, margin wavy and irregular in age, orange-yellow.

Gills decurrent, close, thin, forked, yellowish-orange.

Stem 1 to 2 inches, straight or curved, tapering upwards, fibrous, light orange.

Spores white.

Remarks.—The golden caps of this species add an attractive note of colour to the old log or stump on wood-littered ground-cover from which they have emerged, diverting attention from greater hosts of more sombre-hued members of their tribe. The distinctive forking of the thin gills will readily separate them from similar-appearing species.

There are diverse opinions as to its edibility. Some claim it is poisonous, while others find it wholesome. In doubtful cases of this kind it will be wise to use caution before adding it to the menu. Much may depend on the locality in which it grows. The same species may have different chemical properties in different sections of the country.

Unaccustomed foods may react differently on different people, as no two constitutions are exactly alike. "One man's meat is another man's poison" applies with particular force where mushrooms are concerned.

CHANTERELLE.
(Edible.)

Cantharellus cibarius Fr.
cibarius = concerning food.

Description.—Cap 3 to 5 inches, convex to plane, finally funnel-shaped, margin wavy and irregular, fleshy; colour a rich egg-yellow.

Gills decurrent, shallow, fluted, branched and cross-connected, resembling swollen veins, yellow.

Stem 2 to 4 inches, solid, tapering towards base, pale yellow.

Spores white.

Remarks.—The brilliant yellow of this species is always an attractive note of colour in the sombre gloom of its woodland haunts, where it may be found growing on or among decaying wood.

Bright colours in nature are often a warning to beware, but in this case there is nothing to fear, for the Chanterelle is considered to be an elegant titbit.

In Europe it was esteemed an expensive luxury.

GIANT CLITOCYBE.
(Edible.)

Clitocybe gigantea Fries.
Clitocybe = sloping; referring to the depression in centre of cap.
gigantea = very large, robust.

Description.—Cap 6 to 10 inches, dry, smooth, expanded; white, tinged with tan or pale ochre.

Gills adnate to slightly decurrent, crowded, thick, uneven, creamy.

Stem 2 to 3 inches high, 1 to 2 inches thick, solid, straight, creamy-white.

Spores white.

Remarks.—Any one seeing this mammoth mushroom " breaking " ground in the forest will agree that it is well named " giant " both in size and strength. The huge platter-like cap is almost fully expanded before it gets above the soil so that debris may be carried up with it. Much of this accumulation is automatically pushed off as it rises above the surface by the continued growth of the cap from the centre towards the edge. The species grows singly or in colonies of widely scattered individuals. After the fruiting bodies have decayed, the place of their appearance looks as if someone had gone over the ground with a shovel, digging out chunks of soil here and there.

As an article of diet it is somewhat coarse but not unpleasant to the taste. It is certainly capable of supplying a very hearty meal if bulk be the main consideration.

FUNNEL-FORMED CLITOCYBE. (Edible.)

Clitocybe infundibuliformis Fr.
infundibuliformis = funnel form.

Description.—Cap 2 to 3 inches, convex to funnel-shaped, smooth, slightly silky or downy, margin often wavy and split; colour, peach or tan.

Gills decurrent, close, narrow, uneven, paler than cap.

Stem 2 to 3 inches, slender, often twisted and bent, solid, continuous with cap. Same colour as cap, with short white down at base.

Spores white.

Remarks.—The graceful lines and soft velvet-like appearance of this dainty mushroom is bound to arrest the attention of the woodland rambler in the mild days of autumn and early winter.

It may be found beneath the pines and firs or among the fallen leaves of deciduous trees in groups, clusters, or rows, often in sufficient quantity to form a pleasing adjunct to a meal.

It is both tender and appealing to the taste. The stems should be discarded, for they are inclined to be tough.

VELVET-STEMMED COLLYBIA.
(Edible.)

Collybia veluptipes Curtis.
Collybia = a coin.
veluptipes = velvet foot.

Description.—Cap up to 4 inches, convex to plane, smooth, viscous; tawny, paler at the margin.

Gills slightly adnexed, distant, unequal, broader and rounded behind, tawny or pallid yellow.

Stem 1 to 3 inches, tough, cartilaginous, hollow and fibrous, often curved or twisted, densely minutely pubescent, umber to black.

Spores elliptical, white.

Remarks.—This rather handsome mushroom has a tufted habit of growth, many individuals being so crowded together that their caps are distorted for lack of room to expand symmetrically. It is found growing saprophytically or parasitically on various trees, especially the black poplar. It has also been found occasionally on old railroad-ties, and even on mine-props, nearly a mile below the surface of the ground.

The dark velvety stem will proclaim the identity of this species. The Velvet-stemmed Collybia has a remarkable persistency and resistance to decay, shrivelling up in dry weather, becoming pliable in moist weather. Because of this habit it is an excellent indicator of the degree of moisture in the air. The above character, together with its apparent distastefulness to insects, enables it to exist through nearly every month of the year.

Fresh young specimens correctly prepared make a pleasant fillip to a meal.

SHAGGY MANE. *Coprinus comatus* Fr.
(Edible.)
Coprinus = dung; favouring rich soil.
comatus = shaggy; like a wig or mane.

Description.—Cap 2 to 4 inches long, barrel- to bell-shaped, covered with shaggy scales, splitting at margins, finally deliquescing at maturity; white with yellow-brown scales.

Gills free, linear, very close set, at first white, through pink to black, dissolving with the cap into a black inky fluid.

Stem 3 to 8 inches, hollow, smooth, brittle, creamy-white.

Ring at first lightly attached to stem, soon becoming movable, later slipping to base of stem and disintegrating.

Spores oval, black.

Remarks.—This is a familiar and easily recognized mushroom. The irresistible pressure of its initial stages pushes up the roadside or barnyard soil and similar hard-packed terrain in which it delights to grow. Even well-stamped tennis-courts are no obstacle, provided only that ample nourishment exists below to feed the mycelium. It appears in small clumps of half a dozen individuals or so; these clumps may be part of a larger colony. "Fairy" rings have occasionally been formed by this species.

The apparent disintegration is really a form of autodigestion, the object being to free the spores which are bound in by the tightly packed gills; those at the outer edges only are able to get free, hence the gills are melted away in orderly progression from below up, in this way allowing all the spores to gain access to the air.

The Shaggy Mane is a prime favourite with food connoisseurs, and justly so, for a nicely prepared helping of properly picked specimens is one of the most tasty and easily digested comestibles.

The inky fluid has been used as a makeshift ink by boiling, straining, and adding a small amount of corrosive sublimate to prevent mould. It has even been mixed in ink as a means of identification of handwriting, as the spores, a few of which are always incorporated with the fluid, are imperishable.

GLISTENING COPRINUS.
(Edible.)

Coprinus micaceus Fr.
micaceus = shining, or glistening from the small mica-like scales on cap.

Description.—Cap 1 to 2 inches, thin, ovate to bell-shaped, smooth, striate near margin, covered when fresh with glistening "frosting"; tawny yellow in colour.

Gills adnexed, close, narrow, white through pinkish to black.

Stem 2 to 4 inches, slender, hollow, brittle, silky-white.

Spores brown to black.

Remarks.—There is scarcely any one who has not at some time or other seen colonies of closely packed members of these little fairy

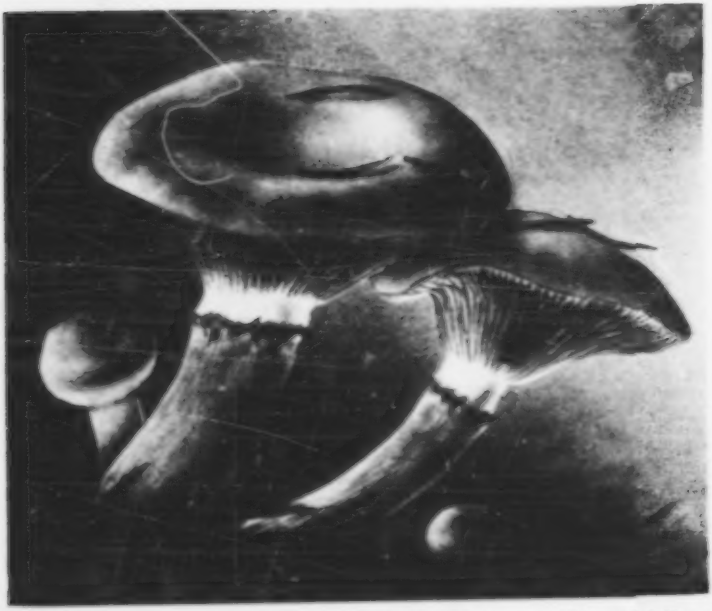
tent-like caps clustered around the base of an old stump or on lawns and boulevards among the grass that conceals decaying wood beneath.

This is one of our most delicious mushrooms, and the fact that it usually occurs in quantity makes up for its small size in providing a satisfying dish at one gathering. It has the added advantage of being easily digested and, like the other Coprini, is an ideal food for convalescents. The Glistening Coprinus, however, is very perishable and can not be kept for more than three or four hours before cooking.

It occurs about deciduous trees, such as maple, alder, or cottonwood, as a source of food-supply. The mycelium attacks only the dead roots when they appear at the bases of living trees.

As with its near relative the Shaggy Mane, autodigestion takes place with advancing age, though this process may be checked in dry weather, only to be resumed on the return of more favourable conditions.

This species has been known to produce 38 pounds of mushrooms in one season around the base of an old elm-stump. Crops in varying amounts have been gathered in the vicinity of one stump through six successive seasons. It is a safe species to eat, in that once known it can not be confused with any poisonous mushroom.



PEG-TOP.
(Edible.)

Gomphidius glutinosus (Schaeff.) Fr.
Gomphidius = a wooden bolt or nail.
glutinosus = gluey, sticky.

Description.—Cap 2 to 5 inches broad, convex, plane to depressed in centre, smooth, very glutinous, livid flesh colour.

Gills decurrent, widely spaced, soft and pliable, branched, whitish to dark grey.

Stem 2 to 3 inches, stout, tapering below, brownish shade to bright lemon below, conspicuously yellow at base both internally and externally. Remains of the cellophane-like veil in form of a fugacious dark-brown ring close to base of gills, the space between pure white or pinkish.

Spores black.

Remarks.—The Peg-top is a common and easily identified species of our open woodlands, bedecking the grassy dells that often form

a pleasing break in the forest. There it may be found in all stages of growth, the sticky cap retaining some of the debris from which it emerged. On whittling away the base of the drab-appearing stem, the exposure of the brilliant yellow colour within is one certain means of establishing its identity. While proved to be edible, it is not especially recommended as an article of diet.

CLUSTERED HYPHOLOMA. (Edible.)

Hypholoma fasciculare Fr.

Hypholoma = web fringe, alluding to the veil which occasionally adheres to the margin in some species.

fasciculare = a bundle, from the close-packed manner of growth.

Description.—Cap ½ to 2 inches across, thin, umbonate, smooth, pale brownish-yellow, darker in centre.

Gills notched, close, rounded behind, pale yellow with tinge of green to purplish-brown with age.

Stem 1 to 3 inches according to position in cluster, firm, hollow, brittle, yellowish-brown, whitish above.

Spores purplish-brown.

Remarks.—This is one of our commonest mushrooms; it may be found in congested clusters at the base of tree-stumps, on lawns and boulevards that conceal old tree-roots, or at the edges and bases of wooden sidewalks and fences.

This species is easily mistaken for other closely related forms. While not recognized as a poisonous species, the advisability of using it as an article of diet is open to question, although other members of the genus are of proved excellence.

It makes a very good pickle or catsup. Only the caps are used; the bitter taste disappears in cooking.

WAXY LACCARIA. (Edible.)

Laccaria laccata (Scop.) Berk. & Brome.
Laccaria = lac or shellac.
laccata = made of lac.

Description.—Cap 1 to 2 inches, tough, thin, convex to plane and depressed in centre, smooth or scaly, watery when moist, reddish-yellow or with tinge of violet.

Gills adnate to decurrent, broad, coarse, distant, flesh-coloured.

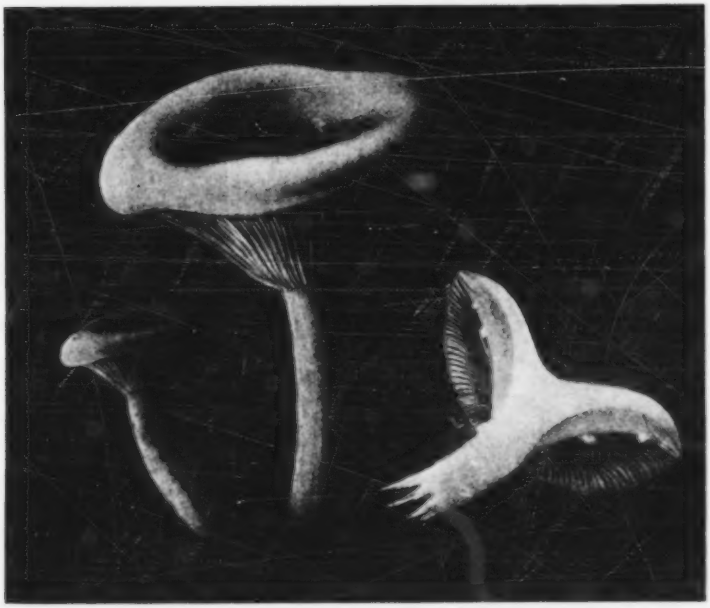
Stem 1 to 6 inches, slender, firm, fibrous, irregular, reddish-yellow to flesh-coloured.

Spores white.

Remarks.—Small colonies of this tough little mushroom may often be found growing on the ground in open woodlands among the grass. In the Victoria district it favours the company of the Garry oak, the brownish caps blending well with the russet of fallen leaves. Sometimes it forms semi-rings, long straggling lines, or dense clumps.

The variety *amethystina* Pk. with brilliant purple gills is very prevalent, often growing along with the typical members of the

species. The caps, though inclined to be tough, are not to be despised as a zest-giving flavour to a meal.



SWEET LACTARIUS. (Edible.)

Lactarius subdulcis Fr.
Lactarius = milk.
subdulcis = almost sweet.

Description.—Cap 1 to 2 inches, smooth, even umbonate, brittle, orange.

Gills adnate to slightly decurrent, narrow, close, even, whitish-pink.

Stem 1 to 2½ inches, tough, solid to fibrous, orange.

Milk white.

Spores white.

Remarks.—The symmetrical little orange caps of this species give a touch of gaiety to the woodland shades in which it grows, dotting

the ground beneath shrubs or along trailsides in loosely grouped patches. Members of the genus are noted for the copious juice which exudes at the slightest scratch. The colour of the juice varies according to the species; in the present case, however, it is milky-white. While many Lactarius species are somewhat hot to the taste, this one is mild in flavour.

CRESTED LEPIOTA.
(Edible.)

Lepiota cristata (A. & S.) Fr.
Lepiota = a scale.
cristata = a tuft or crest.

Description.—Cap ½ to 1½ inches, thin, bell-shaped to convex and plane, slightly umbonate, the surface broken up into concentric circles of small scales, white, scales red-brown.

Gills free, close white.

Stem 1 to 2 inches, slender, fragile, hollow, smooth, white.

Ring small, soon disappearing.

Spores white.

Remarks.—The Crested Lepiota is one of the most dainty mushrooms to greet the eye in our woodland rambles. It is so fragile that the slightest touch will mar its beauty. It usually appears in groups of scattered individuals over a wide tract of suitable ground, surviving longest in the densest thickets.

This Lepiota is a pleasing adjunct to the table, possessing good substance and a pleasant taste.

SMOOTH LEPIOTA.
(Edible.)

Lepiota naucina Fr.
naucina = modest, unassuming.

Description.—Cap up to 5 inches, convex to broadly umbonate, with upturned margin in age, soft, smooth, even, with a kid-glove like texture, pure white.

Gills free, close, uneven, broad, white changing to drab pinkish-brown.

Stem smooth, even, bulbous at base, white.

Ring very distinct, thick, stiff, regular, white.

Spores white.

Remarks.—The snowy freshness of the caps of this elegant mushroom often dot our lawns, pastures, and woodland glades during the early autumn days, where it grows in irregularly formed colonies, occasionally in large numbers.

It is of excellent flavour and bids fair to rival the common mushroom, for it occurs in sufficient quantity to make a worth-while treat; is free from insect pests and is amenable to cultivation. Correct identification is imperative, for it shares in common some features of the Destroying Angel, such as white gills and a veil. It is distinguished from the latter by the absence of a volva or cup; however, the bulbous base must be closely examined in order to be sure of this point. The veil of the Smooth Lepiota is usually very regular in shape and stands out from the stem like a stiff disk, in contrast to the loose pendulous veil of the Destroying Angel.

On toasting the two species, it will be found that the gills of the lepiota soon turn brown while in the amanita they remain white.

Never eat this species for the first time without having the identification confirmed by someone who has had practical experience with it.

GREY PARASOL. *Lepiota rachodes* Fr.
rachodes = ragged.

Description.—Cap 3 to 8 inches, convex to plane, soft with concentric, scale-like fragments, becoming continuous in centre; greyish-white, the scales umber-brown.

Gills free, close uneven, white, pinkish where damaged.

Stem 6 to 8 inches, bulbous at base, decreasing to cap; smooth; pale umber, turning reddish at point of injury.

Ring pronounced, becoming loose and sliding up or down stem.

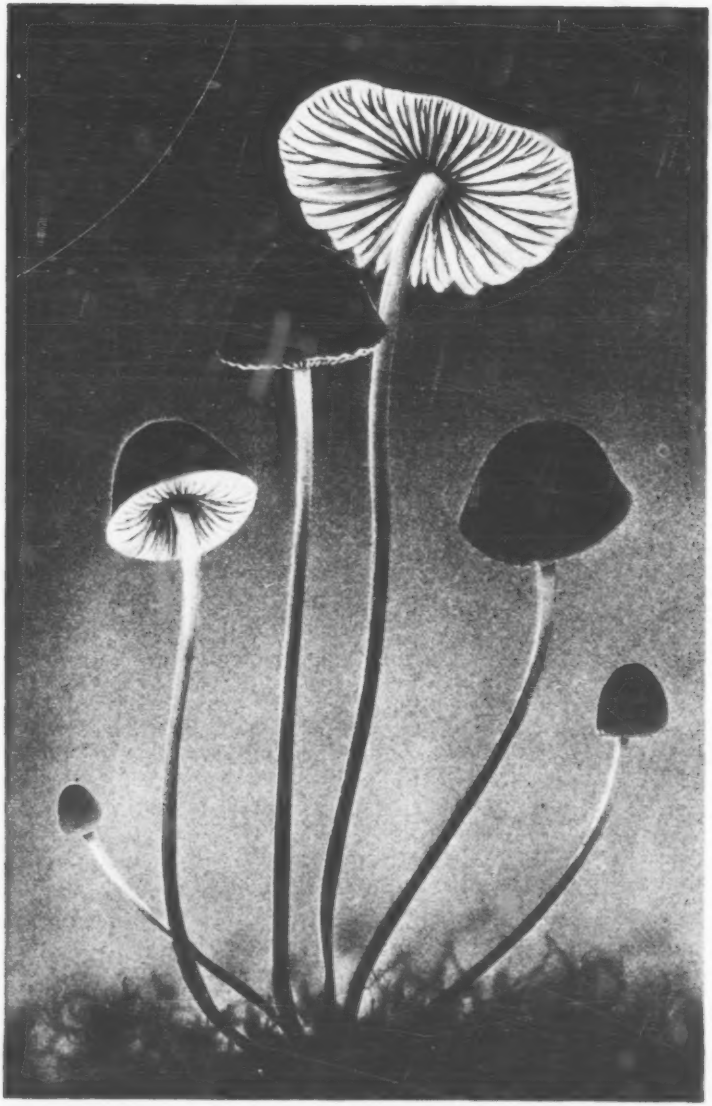
Spores white.

Remarks.—This is a magnificent species. Emerging from the ground in the vicinity of woods or woodland debris as a brown egg-like nodule, it gradually expands into a conspicuous cap of softest texture. It commonly grows in "fairy" rings, sometimes 40 feet

in diameter, and containing as many as 300 individuals, and often in small clumps of a few individuals.

Rich humus soils of woodland glades or old compost heaps of decayed vegetation are its favourite haunts.

While not poisonous it is so similar to Morgan's Lepiota, *Lepiota morgani,* it should be avoided by the inexperienced. The gills have a greenish shade of colour, and the spores are pale green in Morgan's Lepiota.



SCOTCH BONNETS.
(Edible.)

Marasmius bellipes Morg.
Marasmius = withered or shrivelling.
bellipes = beautiful foot (stem).

Description.—Cap 1 to 2 inches, hemispherical to nearly plane, smooth, velvety, rich maroon.

Gills adnate, uneven, widely spaced, pale cream.

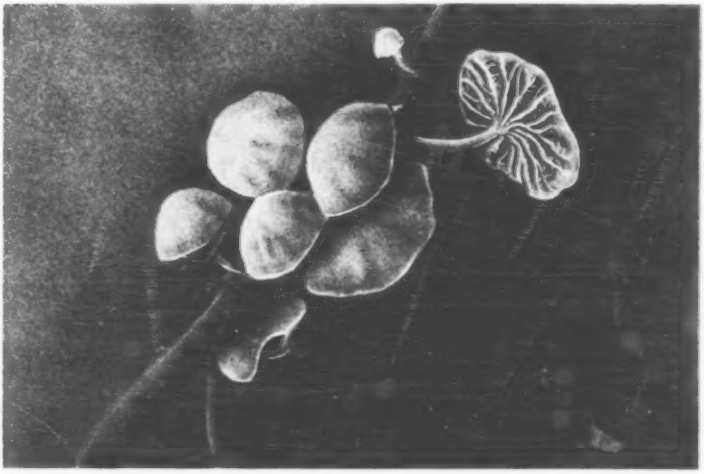
Stem 3 to 4 inches, wiry, slender, red-brown shading to nearly black at base.

Spores white.

Remarks.—One has only to glance at the cap of one of these little beauties to see the fancied resemblance to tiny tam-o'-shanters that suggested the popular name—a name, however, that is also applied to other members of the genus.

Small groups of this elegant species may often be seen in shady woodlands, where they dwell among decaying leaves and other forest litter.

It is usually common in the fall and early winter months.



WHITE MARASMIUS. *Marasmius candidus* Fr.

candidus = shining white.

Description.—Cap ½ to 1 inch, fragile, thin papery, irregular in outline, smooth, pure white becoming tinged with cinnamon beneath with age.

Gills adnexed, uneven, forked, widely spaced with transverse corrugations between, white.

Stem short, slender, curved, white tinged with brown to black at base.

Spores elliptical, white.

Remarks.—The White Marasmius is a charming little mushroom that well repays a visit to its woodland haunts. Their umbrellas are usually found among tangled shrubbery, where they grow on stumps and twigs close to the ground, the ghostly white caps contrasting strongly with the sombre shades of moisture-sodden debris. They are usually to be found in groups of many closely packed individuals. Unlike the fleshy mushrooms, their papery caps afford little attraction to greedy fly larvæ, from whose ravages they seem to be immune. They are long-lived in that they can withstand repeated soaking and drying according to the nature of the weather, alternately expanding or shrivelling as the case may be.

FAIRY-RING MUSHROOM.
(Edible.)

Marasmius oreades Fr.
oreades = mountain nymphs.

Description.—Cap up to 2 inches, tough and pliable when moist, brittle when dry, smooth, convex to plane, slightly umbonate, margin wrinkled in age, brownish-buff to cream colour.

Gills free, broad, distant, uneven, soft, becoming firm with age, cream to ivory-white.

Stem 2 to 3 inches, solid, tough, fibrous, with downy surface, buff.

Spores elliptical, white.

Remarks.—This mushroom is one of our best-known species, for it obtrudes itself on many a lawn and grassy meadow. Its habit of growing in rings and circles attracts attention, where otherwise it might escape notice.

At one time these rings were thought to be due to the action of elves and fairies who danced in the course of their midnight revels, each step marked by a mushroom's appearance in response to the magic touch.

The tendency of the mycelium to grow outwards from its point of origin is the chief factor in the formation of these rings. The soil occupied by the living mycelium is exhausted of its food resources and rendered impervious to moisture, which greatly weakens or kills the grass rooted in this region. As time passes, the older (inner) mycelium gradually dies out, allowing the grass to grow again.

Along the outer, vigorously growing margin the fruiting-bodies or mushrooms are produced each season, and here the grass grows luxuriantly due to the nitrogenous material freed by the decaying mushrooms.

The constantly advancing periphery of the ring is slowly increased from year to year, resulting in rings of 300 to 800 feet in diameter in some instances. The rate of advance may be from 3 to 12 inches per year.

Such "fairy rings" often cause unsightly bare patches on lawns, the only cure for which is to kill the mycelium with one of the fungicides evolved for that purpose.

The Fairy-ring Mushroom is considered to be one of the most delicious of its tribe, particularly to convalescents and those whose digestions are not robust. Whether raw, cooked, or dried, the sweet nutty flavour is the same. In a stew they are of incomparable delicacy; when dried and retained for future use, they give a delectable relish to a soup.

SHINY-STEM MYCENA.
(Edible.)

Mycena galericulata Scop.
Mycena = a fungus.
galericulata = a small peaked cap.

Description.—Cap up to 2 inches, membranous, smooth, with radiating lines to the umbo, conical to expanded, umbonate, dull brown or grey.

Gills adnate, decurrent with a tooth, cross-veined, distant, ventricose, edges entire or serrate, whitish to grey.

Stem variable in length, smooth, rigid, polished, hollow, hairy at base, whitish to flesh colour.

Spores white.

Remarks.—This common little mushroom may be found growing on old logs and stumps or among vegetable debris on the forest floor. Usually to be found in clumps and clusters of many individuals, it is occasionally independent enough to stand alone.

It is somewhat variable in shape and colour and, on that account, may easily be confused with allied species. None of them, however,

is harmful; they may, therefore, be eaten with impunity. Owing to their thin caps, a large number of specimens is required to make a mouthful.

Used when young, they should be stewed in their own juice for ten minutes and seasoned to taste with salt, pepper, and butter.

LITTLE BELL OMPHALIA.
(Edible.)

Omphalia campanella (Batsch.) Fr.
Omphalia = a depression; referring to centre of cap.
campanella = a little bell.

Description.—Cap ¾ to 1 inch, thin, smooth, convex, campanulate, depressed in centre, striate, rusty yellow.

Gills decurrent, close, vinose between, yellowish.

Stem 1 inch, horny, hollow, hairy at base, pale brown at apex.

Spores white.

Remarks.—A group of these dainty little mushrooms as they bedeck a mossy log in some quiet woodland dell gives a lightsome touch to the fallen forest giant; the twinkling yellow bells add a cheerful note to the evidence of decay amid which they live. Not just one or two but dozens of individuals may be seen together, mingling in scattered or close tufts and clusters in profusion and at all angles and slopes upon their moss-padded home.

Although small, it may be taken in sufficient quantity at one picking to make a piquant sauce.

Many other species of this genus will be met with; all are small, usually in large colonies, and possessed of an appealing daintiness in form and colour.

BROWN CHANTERELLE.
(Edible.)

Paxillus involutus Fr.
Paxillus = a stake or peg.
involutus = rolled inward.

Description.—Cap 2 to 7 inches, thick convex to plane, margin at first strongly inrolled, dull, with a velvety appearance, dark brown.

Gills decurrent, branching with cross ridges at juncture with stem, easily separating from the cap; lemon-yellow, turning dark brown where bruised.

Stem short, thick, tapering at base, pale yellow at top merging into brown below.

Spores dark brown.

Remarks.—The plush-like caps on stout stems, nearly the same diameter in the young stage, often appear in abundance on lawns and in grassy places in open woods, on rotten stumps, or wherever decayed vegetation offers a food-supply.

As in so many mushrooms, the older they become the flatter the cap—a process which may be continued until the margins are turned

up, leaving the centre depressed and the gills exposed to the widest possible extent.

While edible, it is dry, coarse, and rather tasteless.

SHOWY PHOLIOTA. *Pholiota spectabilis* Fr.

Pholiota = a scale.
spectabilis = notable; conspicuous.

Description.—Cap 2 to 6 inches, convex to plane, smooth, golden-tan colour.

Gills adnexed, close, narrow, yellow to reddish-brown or rust colour.

Stem 3 to 4 inches, solid, usually curved, thick at base.

Spores rusty.

Remarks.—Well named "showy"—this handsome species will attract attention at once, for its clustered caps occur in masses at the base of old fir-stumps. Here they may be seen in all stages of growth at one and the same time, from small yellowish balls to the large umbrella-like expanses of the mature forms, each overlapping its neighbour in increasing stature as the later ones endeavour to overtop those of earlier growth in order to find room for their expanding caps and so be free to scatter their spores unobstructed. No precise information is to hand as to the edibility of this species, but if it is like most of the members of the genus, it should be excellent.

OYSTER MUSHROOM.
(Edible.)

Pleurotus ostreatus Fr.
Pleurotus = side.
ostreatus = like an oyster.

Description.—Cap 2 to 7 inches across, soft convex or depressed, smooth, white to brownish.

Gills decurrent, broad, branching at base, white.

Stem lateral, very short, hairy at base.

Spores white.

Remarks.—The Oyster Mushroom sometimes occurs in numbers on dead or dying tree-trunks or logs of deciduous trees, such as poplar and alder. It is easily recognized by the overlapping shelf-like caps. It is one of our most popular of the edible species and has been deliberately cultivated in Eastern America by inoculating apple-logs with the spores and then burying them shallowly in the ground. In this way a constant supply has been maintained during the season.

This species has been termed the shell-fish of the forest. Dipped in egg, rolled in bread-crumbs, and then fried, it constitutes a delicious and satisfying part of a meal.

FAWN-COLOURED PLUTEUS.
(Edible.)

Pluteus cervinus Fr.
Pluteus = a shed or cover.
cervinus = a deer; colour of a deer.

Description.—Cap 2 to 8 inches across, satin smooth, bell-shaped to flat, convex when expanded, dark chocolate-brown to fawn colour; margin white.

Gills free, broad, unequal, very brittle, white with an ivory tinge to pale flesh colour.

Stem 3 to 5 inches, continuous with cap, thick, straight or curved, white.

Spores pink.

Remarks.—This mushroom may be found on old fir-stumps and rotten logs in autumn woods. The plump buttons of the young stages and the inverted saucer-like caps of the old arouse enthusiasm both from an æsthetic and a culinary point of view. There is nothing more tasty than the rich beef-like flavour of fresh young specimens fried in butter.

It is exceedingly fragile despite its robust appearance, splitting into fragments at the least jolt.

TAN-COLOURED RUSSULA.
(Edible.)

Russula alutacea (Pers.) Fr.
Russula = reddish; from the prevailing colour in many of the species.
alutacea = colour of leather; tanned.

Description.—Cap 2 to 5 inches, convex to expanded and depressed in centre, smooth, very sticky, red to black-purple.

Gills free, thick, broad, connected by veins, equal, cream to bright ochre.

Stem 2 to 3 inches, stout, solid, white to stained with reddish.

Spores minutely spiny, yellow.

Remarks.—This species closely resembles the Whole Russula but differs in not having powdery gills.

This member of the distinctive genus *Russula* is usually found in one's and two's in woodland dells and borders, though often in association with others of its tribe. The sticky and often blood-red caps cause it to be viewed with distrust, but fresh plants possess a good flavour, and on better acquaintance it becomes a favourite with mushroom-lovers. Old plants should be left severely alone.

DOUBTFUL STROPHARIA.

Stropharia ambigua (Peck) Zeller.
Stropharia = sword-belt; in reference to the ring.
ambigua = of two minds; similar to another species.

Description.—Cap 1 to 3 inches, oval to plane, viscid when moist, smooth, solid, margin often with remnant of veil in fragments, brownish-cream.

Gills adnate, close, uneven, white to purple-brown.

Stem 3 to 5 inches, slender, even, solid, smooth with mealy powder when fresh.

Ring evanescent.

Spores purple-brown.

Remarks.—The usually regular and symmetrical form of this species is often seen as it stands alone or in clusters of a few scattered individuals in our open woodlands during the fall and early winter months. While its culinary possibilities are not advertised, there is no reason why it should not be as acceptable as most other members of this genus. As in other cases, " when in doubt cut it out " from the food-basket.

BLUE BONNETS.
BLEWITS.
(Edible.)

Tricholoma personatum Fr.
Tricholoma = hair-fringe.
personatum = wearing a mask; changing hues.

Description.—Cap 2 to 5 inches, convex to plane, margins often strongly turned up at maturity, smooth, with mealy particles adhering to margin in young stage; pale lilac to tawny or rusty in age. Flesh

typically white; in western species it is inclined to have a pale purplish colour.

Gills adnexed, notched, close, uneven, violet or whitish.

Stem 1 to 3 inches, short, stout, solid, narrowing from a bulbous base, with downy film in young specimens, smooth in age; pale lilac.

Spores white to pale salmon.

Remarks.—The Blue Bonnet is one of our most handsome and useful mushrooms. The peach-like bloom when in its prime is very characteristic. A sociable species, it congregates in groups disposed in rows or rings in the shelter of our woodland borders.

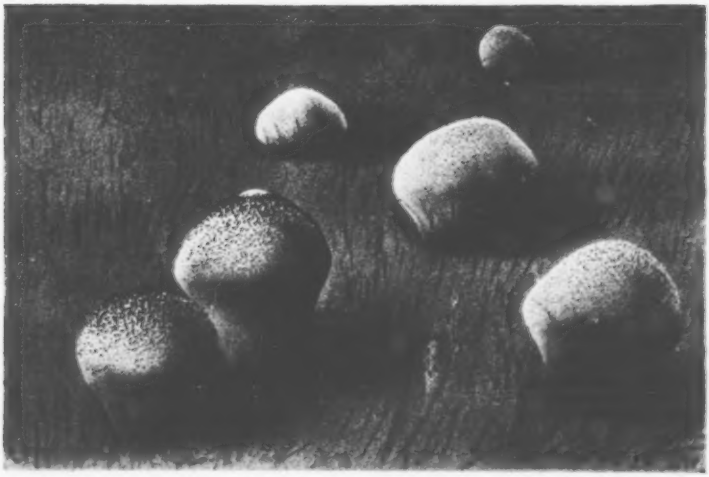
Rings 12 or more feet in diameter are occasionally met with, often with the trunk of a coniferous tree marking the centre. Sometimes the caps are so crowded together as to be distorted for lack of room to expand normally.

This is a common and easily identified mushroom. At one time it was the source of a blue dye, while a song sparrow has been seen to take advantage of its attraction for flies by tearing up old specimens for the larvæ contained therein.

It is a most delectable adjunct to the table and is usually to be found in sufficient numbers to make a substantial meal.

While most abundant in the autumn months, it is occasionally to be found in the spring and early summer in moist sheltered locations.

The genus *Tricholoma* is a large one, containing many other species that are noted for their size and beauty.



GEMMED PUFFBALL.
(Edible.)

Lycoperdon gemmatum Batsch.

Lycoperdon = wolf and to break wind. Their abundance at times suggesting possible exhaustion of soil, and the clouds of "smoke" as the spores are borne away indicating direction of wind.

gemmatum = a bud.

Description.—Fruiting-body 1 to 2 inches by 1 to 1½ inches wide, top-shaped, sometimes very irregular from overcrowding, outer covering with small spines or warts. Spore-bearing cavity is within upper part of body. Spores formed on basidia as in mushrooms but on small threads or hyphæ within the body and not externally on gills as in the former. The ripe spores are emitted through an opening at the top of the body.

Spores globose, minutely warted, olive in colour.

Remarks.—A puffball and the early stage of a mushroom are very similar in external appearance. A vertical section will soon distinguish the two; the former will be solid and pure white when not fully developed, while the latter will show the tightly packed stem and gills of the future mushroom.

The most characteristic feature of the puffball is the production of clouds of "smoke," consisting of prodigious numbers of spores. In one of the very large puffballs (*Calvatia gigantia*) it has been estimated that 7,500 billion spores are formed, and that if each of these grew into a similar ball down to the second generation, a fungus colony 800 times the size of the earth would be produced! As a matter of fact, only a very few spores from each individual are likely to reach sites favourable for development.

The copious supply of spores has proved useful in emergencies as a styptic or absorbent to arrest bleeding in cases of cuts and wounds. "Smokeballs" and "Devil's Snuffbox" are other names given to these structures according to place and period in history.

All puffballs make a pleasant addition to a meal, provided they are pure white inside and quite firm and solid; discard any that exhibit a yellowish tinge. A simple and efficient way to prepare them is to cut in fairly thick slices and fry in butter.

THE EARTH-STARS. FAMILY GEASTRACEÆ.

COLLARED EARTH-STAR. (Edible.)

Geaster triplex Jung.
Geaster = of the earth, and star.
triplex = threefold (layers of outer coat).

Description.—Up to 1½ inches in diameter in young stage, bulb-like with an apical point, reddish-brown.

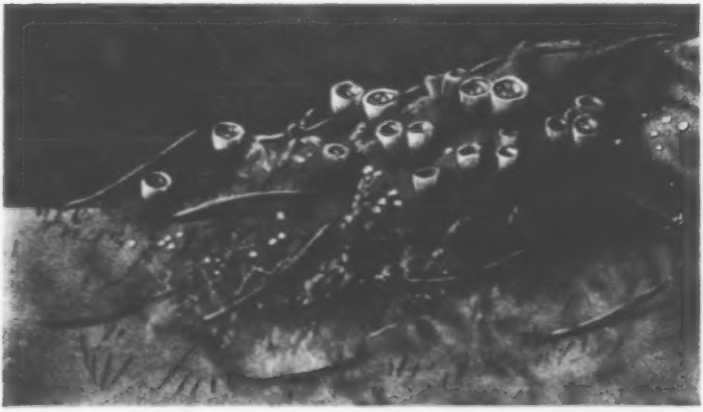
At maturity outer coat splits into six or eight radial segments, curving out and downwards, inner capsule resting on saucer-like collar; earthy or dust colour.

Remarks.—The specimens illustrated were growing as part of a small colony in all stages of development on the leaf-littered forest floor in late autumn. The spores are emitted as a smoke-like puff through the apical aperture at the slightest pressure on the capsule.

The young bulb-like stage is edible, but only if firm and solid.

Very similar to this is the Water-measuring Earth-star, *Geaster hygrometricus* Pers. In wet weather the inner lining of the rays swells up and so holds the points flat on the ground. In dry weather the lining contracts, thus causing the rays to curve up and clasp the inner sac. In the last condition the least disturbance by wind or other mechanical means sets the whole plant rolling. The spores are thus likely to be more widely scattered than if the fruiting-body had remained stationary.

THE BIRD-NESTS. FAMILY NIDULARIACEÆ.



COMMON BIRD-NEST. *Crucibulum vulgare* Tul.

Crucibulum = a little cup.
vulgare = common.

Description.—One quarter inch by 3/8 inch, cup- or goblet-shaped, tough, minutely rough pubescent outside, smooth inside; tan colour, lighter inside, bleaching white with age.

When young, with yellowish lid, which disappears at maturity. Spores in peridioles or packets suggesting eggs. Each peridiole anchored by an elastic thread within the cup.

Remarks.—Even the most casual observer will exclaim with delight on the finding of these unique little goblets as they dot some decaying twig or old board lying beneath the shade of a tree. They look for all the world like miniature birds'-nests with eggs complete, in comparison with which a hummingbird's nest, tiny as it is, is as a mammoth to a mouse.

The elastic threads holding the "eggs" within the cup's interior are supposed to enable them to cling to some distributing agent, such as a beetle's leg and the like, and so be transported to new pastures. On the other hand, some evidence has been found to show that the "eggs" can be distributed by means of drops of rain, hence the "nests" have been given the name of "splash cups."

In all cases, no matter by what means dispersal has been carried out, the spore can only be released from the "egg" on the disintegration of its "shell."

In the fall of the year and winter months the development of the Bird-nest may be watched from tiny pinhead-sized pellets to the mature "fairy" cup.

There are several genera and species belonging to this intriguing little family, all very much alike but differing in details as to shape, colour, attachment of the peridioles, and the number of coats comprising the goblets. In all cases also, the "nests" are but the reproductive stage of the fungus feeding and growing within rotten wood.

GLOSSARY.

Adnate—gills attached to stem by full width.
Adnex—touching stem, but not attached.
Amphigenous—on all sides.
Anastomose—running together or joined by cross-veins.
Archegonium—a receptacle containing the ovum.
Arachnoid—like a spider-web.
Ascus—a cell containing a number of spores.
Ascocarp—the fruiting part of the fungus, bearing the asci (a specialized structure in which the asci are borne).
Basidium—a modified terminal cell of a hypha, usually bearing four external spores at the tip.
Chlorophyll—the green colouring-matter in plants.
Caespitose—growing in tufts or clumps.
Convex—arched.
Cystidia—sterile cells of the hymenium, generally larger than the basidia cells with which they are found.
Decurrent—gills running down the stem.
Deliquescent—dissolving.
Echinate—spiny.
Evanescent—not persisting.
Even—without irregularities.
Fibrillose—having fine parallel fibres, as seen on caps of some species.
Floccose—fluffy, like wool.
Free—edges of gills not touching the stem.
Fugacious—soon disappearing.
Gametophyte—that phase of a plant bearing the sex cells.
Gills—vertical radiating plates on under-surface of cap.
Gleba—spore-bearing tissue, when enclosed, as in puffballs.
Haustoria—suckers, penetrating through cell walls of host.
Host—the plant or animal on which a parasite lives.
Hyaline—clear, glassy.
Hymenium—spore-bearing tissue in a continuous layer.
Hymenophore—that part of the fruiting-body bearing hymenium.
Hypha—one of the elemental threads of which the mycelium, sporophore, and hymenium is composed.
Inferior—below, underneath.
Lamellate—gill-bearing.

Mycelium—the combined hyphæ constituting the vegetative part of most fungi. The " spawn " of mushroom beds.

Peridiole—a small seed-like body in a peridium.

Peridium—the outer coat of fungi with hidden sport-bearing tissues, as in puffballs, bird-nests, etc.

Pileus—cap.

Plane—having a flat surface.

Photosynthesis—the process of converting the raw elements into food with the aid of sunshine and chlorophyll.

Plicate—in folds.

Rhizoid—hair-like filaments resembling fine roots.

Rhizomorph—like a root, composed of parallel strings of hyphæ.

Sinuate—undulate edge of gill, especially where it joins the stem.

Smooth—glabrous, without hairs or other projections although surface may be uneven.

Sporophore—that part of a fungus bearing the spores as distinct from the vegetative mycelium.

Striate—minutely fluted or channelled; parallel on stem, radiate on cap.

Stipe—stem.

Trama—the tissue of cap extending into the central part of the gill-plate.

Umbonate—having a central boss-like elevation.

Vesiculose—bladder-like, minute cavities in the cap-tissue.

Viscid—sticky.

Venose—vein-like, cross veins between gills.

Ventricose—swollen in the middle.

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APPENDIX.

Poisonous or not?

A good deal of popular interest in mushrooms is centred on their edible or poisonous qualities. Thus one of the prevailing questions regarding them is usually, " Is it good to eat or is it poisonous? "

An accurate knowledge in this regard is of first importance, for with it an abundant source of palatable and nutritious food is made available to those wishing to add variety to their diet; without this knowledge the penalty of death may be the consequence.

At the outset it is as well to emphasize that there is no dependable method of distinguishing between those that are edible and those that are poisonous; our present knowledge on this point is based entirely on the simple expedient of trial and error.

It is taken for granted of course that only fresh young specimens, free from insect contamination, are used for the table; also that too much time does not elapse before consumption, for serious consequences may result from merely eating old or infected specimens, apart from any poisonous properties they might otherwise possess.

The species so studied have been recorded, together with an exact description of the reactions involved. There is, therefore, no reason why any one should be poisoned or, on the other hand, be deprived of a tasty morsel for lack of information, as it is available to all who seek it. In this connection the best authority is one who is constantly searching out and using the various species of the neighbourhood. It would be very unwise in the beginning to rely entirely on book knowledge, though no opportunity should be lost in acquiring as much information from this source as possible; theory and practice go hand in hand.

Several rule-of-thumb methods for distinguishing the edible from the poisonous species are commonly advocated. Among these may be mentioned peeling of the cap, silver turning black when immersed in the fluid in which they are cooking, colour, taste, of trying out on other animals, and so forth. On application, however, not one of these tests is reliable. After all, we acquire knowledge concerning the harmful snakes, insects, or other types of plants from records of personal experience. Mushrooms are no exception to this rule, and once the species is recognized, there is no danger of confusing poison-

ous with non-poisonous species. In view of the serious possibilities arising from a mistaken identification, we will conclude our remarks on this subject by emphasizing the advice: DO NOT EAT ANY MUSHROOM UNLESS YOU ARE ABSOLUTELY SURE IT IS SAFE TO DO SO.

A few general words of caution may not be out of place to the beginner who contemplates a meal of mushrooms: Avoid white-gilled species; do not confuse puffballs with the button stages of gilled mushrooms, as they are both externally similar.

FOOD VALUE.

Mushrooms have at times been both over- and under-rated as regards their food value. On the one hand they have been reported as equivalent to a beef-steak in vegetable form, while on the other they have been assessed only as a condiment or appetizer and of no nutritional worth, apart from the fact that they are a most delicious and palatable adjunct to a meal.

Recent researches on the common edible mushroom, *Agaricus campestris*, place its food value on a more accurate basis than heretofore ascertained. The protein content of this mushroom averages around 3.94 per cent. as compared with beef 15 per cent., eggs 13.4 per cent., wheat 13.8 per cent., cabbage 1.6 per cent., potatoes 2.2 per cent. This percentage of 3.94 is below the protein requirement of the body but has been proved by experiment to be sufficient not only to maintain life but to allow for some growth. Mushroom protein is classed as " partially incomplete " and is similar to gliadin of wheat and hordein of barley. It should, therefore, be supplemented by protein from some other source.

The mineral content compares favourably with most vegetables and fruits and is in some cases slightly higher. Iron and copper are in fair amounts; the former is of special importance as this essential element in available form is low in so many of the commonly used foods. Potassium and phosphorous salts, with a trace of calcium, make up the bulk of the ash.

It is in relation to the vitamin content that recent research has been more especially directed, and the common mushroom has been found to be one of the best plant sources of some of the Vitamin B complex, including riboflavin and thiamin; small amounts of Vitamin

C (ascorbic acid) and Vitamin K (nicotinic and pantothenic acids) are also present.

It has been estimated 3½ ounces (100 grams) of freshly prepared mushrooms contain one-fifth of the amount of riboflavin and over one-quarter of the amount of nicotinic acid required daily by adults.

Thus the common mushroom would seem to have a definite food value. However, when compared pound for pound with other substances, it should be noted that the water content is fairly high; namely, 89.5 per cent.

Aside from this factual analysis there are two important features in connection with the food value of mushrooms that should not be overlooked.

First, the appeal of these very unique flavours is in itself a valuable factor in that the stimulation so effected is conducive to a better assimilation of other and more nutritious foods, and, second, the necessity of proper cooking in order to make the most of these excellent properties. With unskilled preparation the fine flavours are lost and the mushroom itself rendered unpalatable.

Preservation.

Mushrooms as a whole are difficult objects to preserve. However, in order to give authority to any account of a district, access to the material on which it is based is imperative if it is to have any scientific value.

The most practical method of keeping the soft and fleshy species is to dry them over a radiator or similar source of moderate heat; they will shrink beyond all semblance of the living form, yet they will retain most of the essential characters used in determination. It is advisable, however, to supplement the dried specimens with notes on the original form, colour, and stages of growth, together with details of habitat, time of year, and other pertinent features.

Spore-colour is an important aid in the segregation of many species for determination. This is easily obtained by placing a stemless cap, gills down, on a piece of paper and leaving it for a while; the spores will then be found to have accumulated in a mass, giving a more definite colour conception than could be done by looking at an individual spore.

Dried specimens may be slightly dampened and lightly pressed between blotters, then stored in envelopes which can be filed as in a card-catalogue system.

The woody bracket fungi need no further treatment than thorough drying before placing in storage.

Precautions should be taken against insect pests by keeping a constant supply of naphthalene or other insect deterrent in the storage-boxes.

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